NON-PUBLIC?: N
ACCESSION #: 9204170135
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Palo Verde Unit 2 PAGE: 1 OF 07

DOCKET NUMBER: 05000529

TITLE: Reactor Trip Due to Low Steam Generator Level
EVENT DATE: 01/09/92 LER #: 92-001-01 REPORT DATE: 04/09/92

OTHER FACILITIES INVOLVED: N/A DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 017

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Thomas R. Bradish, Compliance TELEPHONE: (602) 393-5421
Manager

COMPONENT FAILURE DESCRIPTION:
CAUSE: B SYSTEM: JB COMPONENT: XIC MANUFACTURER: F180
REPORTABLE NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

At approximately 1653 MST on January 9, 1992, Palo Verde Unit 2 was in Mode 1 (POWER OPERATION) at approximately 17 percent power when an automatic reactor trip occurred due to low level in the number 1 steam generator because a feedwater supply valve did not open automatically as required. The reactor trip occurred during power ascension following a refueling outage. Following the reactor trip, the plant was stabilized in Mode 3 (HOT STANDBY) at normal operating temperature and pressure. The reactor trip was diagnosed as an uncomplicated reactor trip in accordance with the emergency plan implementing procedures. Prior to the automatic reactor trip, Control Room personnel began reducing power, started the "B" motor driven Auxiliary Feedwater pump and established auxiliary feedwater flow to the number 1 steam generator. No other safety system responses occurred and none were required.

The cause of the feedwater supply valve not opening was fatigue failure

of wires connected to a switch assembly on the auto/manual controller for the valve. The fatigue failure of the wires prevented the feedwater supply valve from receiving an open signal from the main feedwater control system. The root cause of failure of the auto/manual controller switch assembly was fatigue failure. Contributing to this failure was that the controllers were manufactured from relatively brittle Norel plastic. As immediate corrective action the faulty controller was replaced.

There have been no previous similar events reported pursuant to 10CFR50.73.

END OF ABSTRACT

I. DESCRIPTION OF WHAT OCCURRED:

A. Initial Conditions:

At 1653 MST on January 9, 1992, Palo Verde Unit 2 was in Mode 1 (POWER OPERATION) at approximately 17 percent power during startup from a refueling outage.

B. Reportable Event Description (Including Dates and Approximate Times of Major Occurrences):

Event Classification: Any event or condition that resulted in manual or automatic actuation of any Engineered Safety Feature (ESF), including the Reactor Protection System (RPS)(JC).

At approximately 1653 MST on January 9, 1992, Palo Verde Unit 2 experienced an automatic reactor (RCT)(AC) trip due to low level in the number 1 steam generator (AB) because a feedwater supply valve (FCV)(SJ) did not open automatically as required. The reactor trip occurred during power ascension following a refueling outage. Following the reactor trip, the plant was stabilized in Mode 3 (HOT STANDBY) at normal operating temperature and pressure. The reactor trip was diagnosed as an uncomplicated reactor trip in accordance with the emergency plan implementing procedures. Prior to the automatic reactor trip, Control Room personnel (utility, licensed), in response to the decreasing steam generator level, began reducing power, started the train "B" motor driven auxiliary feedwater pump

(P)(BA) and established auxiliary feedwater (BA) flow to the number 1 steam generator. No other safety system responses occurred and none were required.

The Palo Verde steam generators use dual feedwater flow paths (SJ) during normal operation. One flow path is through the six (6) inch downcomer line (SJ). The other flow path is through the 24 inch economizer line (SJ). From initial startup to approximately 15 percent power, feedwater to the steam generators is directed through the downcomer line. At approximately 15 percent power, feedwater flow is redirected from the downcomer line to the economizer line. This swapover is accomplished by the feedwater control system (JB) automatically closing the downcomer valve (ISV)(SJ) and then throttling the economizer valve (FCV)(SJ) open.

Prior to this event at approximately 1645 MST on January 9, 1992, reactor power was increased from approximately 14 percent to approximately 17 percen
power for feedwater swapover. The
downcomer valves for both steam generators closed and steam generator levels began to decrease as expected. The feedwater

control system initiated an "open" demand signal to throttle the economizer valves open to provide the required flow and maintain steam generator level. At approximately 1649 MST, the level in the number 2 steam generator began to recover as expected, but the level in the number 1 steam generator continued to decrease. The feedwater control system responded to the decreasing level in the number 1 steam generator by increasing the "open" demand signal to the economizer valve and increasing the main feedwater pump (P)(SJ) speed. At the same time, a Control Room Reactor Operator (utility, licensed) also increased main feedwater pump speed to raise steam generator level. At the swapover power levels (approximately 15 to 17 percent power), the economizer valves only open approximately two (2) to three (3) percent. This small change in valve position is not readily observable on the valve position indication available in the Control Room. Control Room personnel were not aware that the "open" demand signal which is observable on the control board, was not being sent to the economizer valve.

At approximately 1652 MST, while Control Room personnel were

investigating the cause of the low steam generator number 1 level, the operating main feedwater pump tripped on high discharge pressure. Control Room personnel (utility, licensed) reduced power, started the train 'B" motor driven Auxiliary Feedwater pump (P)(BA) to establish auxiliary feedwater (BA) flow to the number 1 steam generator, and restarted the main feedwater pump to establish feedwater flow through the downcomer line. At approximately 1653 MST, the reactor automatically tripped on low steam generator level. During the same time period, with steam generator level approaching the low level trip setpoint and anticipating a reactor trip, a Control Room Reactor Operator (utility, licensed) depressed the manual trip push button. The minimum level reached in the number 1 steam generator was approximately 42 percent. The trip setpoint in Technical Specification (TS) 2.2.1, Table 2.2-1, "Reactor Protective Instrumentation Trip Setpoint Limits" is greater than or equal to 44.2 percent for low steam generator level.

An investigation of the event determined that the economizer valve did not open as required during the swapover.

C. Status of structures, systems, or components that were inoperable at the start of the event that contributed to the event:

Other than the economizer valve discussed in Section I.B, no other structures, systems, or components were inoperable at the start of the event which contributed to this event.

D. Cause of each component or system failure, if known:

The cause of the economizer valve not opening during the swapover was fatigue failure of wires connected to a switch assembly (HS)(JB) on the main control board auto/manual controller (XIC)(MCBD)(JB) for the number 1 steam generator economizer valve. The fatigue failure of the wires prevented the economizer valve from receiving an open signal from the main feedwater control system during the swapover. An investigation determined that the auto/manual controller switch assembly configuration allows switch travel past the required switch position (i.e., past switch detentes) resulting in a failure of one (1) of two (2) screws securing the auto/manual switch assembly to the controller. This allowed the switch

assembly to repeatedly move when the switch position was changed causing the fatigue failure of the wires connected to the switch assembly.

E. Failure mode, mechanism, and effect of each failed component, if known:

The fatigue failure of the wires connected to the switch assembly prevented the economizer valve from receiving an open signal from the main feedwater control system during the swapover. This resulted in the reactor trip on low steam generator level when the downcomer valve closed and the economizer valve failed to open during the swapover, isolating both feedwater lines to the number 1 steam generator.

F. For failures of components with multiple functions, list of systems or secondary functions that were also affected:

Not applicable - no failures of components with multiple functions were involved.

G. For a failure that rendered a train of a safety system inoperable, estimated time elapsed from the discovery of the failure until the train was returned to service:

Not applicable - no failures that rendered a train of a safety system inoperable were involved.

H. Method of discovery of each component or system failure or procedural error:

The fatigue failure of the wires connected to the switch assembly was discovered by maintenance and engineering personnel (utility, nonlicensed) during an investigation of the reactor trip and the failure of the economizer valve to open. There were no procedural errors which contributed to this event.

I. Cause of Event:

APS engineering has evaluated this event and concluded that the root cause of failure of the auto/manual controller switch assembly was fatigue failure (SALP Cause Code E: Component Failure) as described in Section I.D. Contributing to this

failure was that the controllers were manufactured from relatively brittle Norel plastic. The engineering evaluation of this event also found that the method operations personnel used for repositioning the switch may have contributed to this event. Engineering noted that the manner in which the switch was sometimes operated (i.e., "flipping" it), which along with the brittle Norel plastic, may have resulted in failure of the screw mounting posts as described in Section I.D.

No unusual characteristics of the work location (e.g., noise, heat, poor lighting) directly contributed to this event. There were no procedural errors which contributed to this event.

J. Safety System Response:

Other than the reactor trip described in Section I.B, there were no safety system responses and none were necessary.

K. Failed Component Information:

The auto/manual controller is manufactured by Foxboro Company. It is model number 255PA custom ECEP-9133.

II. ASSESSMENT OF THE SAFETY CONSEQUENCES AND IMPLICATIONS OF THIS
EVENT:

The plant responded as designed, no safety limits were exceeded, and the event was bounded by the safety analysis in the Palo Verde Updated Final Safety Analysis Report (FSAR). The purpose of the reactor protection system low steam generator level reactor trip is to provide sufficient time for actuating the emergency feedwater pumps to remove decay heat from the reactor in the event of a reduction in steam generator water inventory. The trip setpoint for the reactor trip on low steam generator level is required to be set at greater than or equal to 44.2 percent (TS 2.2.1, Table 2.2-1). The minimum level reached in the number 1 steam generator during this event was approximately 42 percent. The trip setpoint for the low steam generator level auxiliary feedwater engineered safety features actuation system is required to be set at greater than or equal to 25.8 percent (TS 3.3.2, Table 3.3-4). Therefore steam generator level was maintained well above the trip setpoint for the low steam generator level auxiliary feedwater engineered safety features actuation system.

This event is categorized as a decrease in heat removal by the secondary system. The Palo Verde Updated FSAR analysis for loss of feedwater is analyzed at 100 percent power, Loss of feedwater is a moderate frequency event and is primarily concerned with the potential for overpressurization. The event described in this LER is bounded by the Palo Verde safety analysis described in the Updated FSAR. Both primary and secondary pressures remained below safety limits 2750 pounds per square inch absolute (psia) for pressurizer pressure and 1375 psia for secondary pressure!. Pressurizer (AB) pressure remained less than 2268 psia during this event. Secondary pressure remained below the lift setpoints (first bank lifts at 1250 psia) of the main steam safety valves (RV)(SB). Actual peak secondary pressure was less than 1222 psia. The bounding peak pressure event for Palo Verde is the loss of condenser vacuum discussed in Updated FSAR Section 15.2.3. Specified acceptable fuel design limits were not challenged during this event.

Based on the above, there were no adverse safety consequences or implications as a result of this event. This event did not result in any challenges to fission product barriers or result in any releases of radioactive material. This event did not adversely affect safe operation or the health and safety of the public.

III. CORRECTIVE ACTION:

A. Immediate:

The plant was stabilized in Mode 3 (HOT STANDBY) at normal operating temperature and pressure. The faulty controller was replaced.

B. Action to Prevent Recurrence:

1. Operations personnel in all three units were briefed on the proper operation of the auto/manual switches and how to identify a loose auto/manual switch.

2. There are 15 of these type controllers used in each unit. All of these controllers are used in nonsafety related funct
ons. The controllers were checked in Units 1, 2 and 3. Three (3) controllers, one (1) in each unit, had loose switch assemblies. The controllers in Units 1 and 2 have been replaced. A replacement controller is not available onsite to replace the loose controller in Unit 3. The replacement controller is expected onsite by the end of

April 1992. The Unit 3 controller is for one (1) of the Unit 3 steam bypass control valves (SBCV).

3. APS contacted Foxboro Company and Foxboro Company provided the following information. In early 1983 APS converted from the Foxboro model 270 series to the old model 250 series (style F model 255PA) due to a qualification problem with the model 270 series. In late 1983 Foxboro Company made a product improvement (style G) on the model 255PA controllers that included:

1. Replaced Norel plastic with less brittle Lexan plastic.

2. The alarm indicating bulb was replaced with an LED.

Foxboro Company considered this to be a product improvement and did not make any notification to industry of this change. The style F controller is no longer available.

There are nine (9) style F controllers installed in Unit 1, six (6) style F controllers installed in Unit 2, and eight (8) style F controllers installed in Unit 3. APS has not experienced this type of failure with the style C controllers. The style F controllers will be replaced with style G controllers during the next refueling outage for Units 1, 2, and 3.

IV. PREVIOUS SIMILAR EVENTS:

No other previous events have been reported pursuant to 10CFR50.73.

Arizona Public Service Company
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JAMES M. LEVINE 192-00779-JML/TRB/RKR
VICE PRESIDENT April 9, 1992
NUCLEAR PRODUCTION

U. S. Nuclear Regulatory Commission

Attention: Document Control Desk
Mail Station P1-37
Washington, D.C. 20555

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Unit 2
Docket No. STN 50-529 (License No. NPF-51)
Licensee Event Report 92-001-01
File: 92-020-404

Attached please find Supplement 1 to Licensee Event Report (LER) 92-001 prepared and submitted pursuant to 10CFR50.73. This supplement is being submitted to provide the root cause of failure for a switch assembly which malfunctioned during the event. In accordance with 10CFR50.73(d), a copy of this supplement is being forwarded to the Regional Administrator, NRC Region V.

If you have any questions, please contact T. R. Bradish, Compliance Manager, at (602) 393-5421.

Very truly yours,

JML/TRB/RKR/mh

Attachment

cc: W. F. Conway (all with attachment)
J. B. Martin
D. H. Coe
INPO Records Center

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